International Journal of Computer Science Education in Schools, February 2026, Vol. 7, No. 3

ISSN 2513-8359

Teaching Computer Science: Analysing the Key Factors Affecting Educators' Professional Motivation[1]

Özcan TOY[1]

Serhat Bahadır KERT[2]

[1]Yıldız Technical University, Türkiye, ozcantoy@gmail.com

[2]Yıldız Technical University, Türkiye, sbkert@yildiz.edu.tr

DOI: 10.21585/ijcses.v7i3.243

Abstract

Computer science education is essential and presents both pedagogical and technological problems. Computer science educators must possess a passion for computing and education. This study investigated the professional motivation of computer science educators. A robust and reliable scale has been developed to evaluate the elements influencing the professional motivation of computer science instructors. The study used a quantitative correlational survey model. The scale was created utilizing data from 798 computer science scholars across Turkey's provinces. Data was gathered in three stages. The Exploratory Factor Analysis (EFA) involved 246 instructors, the Confirmatory Factor Analysis (CFA) included 366 teachers, and the final application encompassed 186 teachers. The data analysis software utilized was SPSS version 25.0 and AMOS version 24.0. The findings indicate that CFA was employed to examine a structure comprising 18 elements and two factors. The results indicated that instructors' motivation did not significantly vary based on gender, alma mater, years of experience, or location of assignment. A notable disparity was detected in the management factor based on the educational level of the teachers (primary, secondary, or high school). Independent samples t-tests revealed no significant difference in motivation scores based on gender ($t[184]=.102$; $p>0.05$). ANOVA results indicated no significant differences based on years of professional experience ($p=0.068$; $p<0.05$) or city of assignment ($p=0.199$; $p<0.05$). ANOVA indicated a significant impact of educational level ($p=0.058$; $p<0.05$) on the management-based factor. Post hoc comparisons (Tukey HSD) revealed that high school teachers exhibited considerably greater management-related motivation than their counterparts at the primary and secondary levels.

Keywords: Computer science, teacher, motivation, professional motivation, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), ANOVA.

[1] This research has been derieved from the first author's master thesis

ISSN 2513-8359

1. Introduction

In the last thirty years, computer science has become an essential discipline in technology and education (Popovich et al., 2008). The widespread use of computers is increasingly viewed as a vital skill in the digital age, requiring the integration of computer science courses into educational programs. This integration has amplified the importance of computer science educators' motivation. The motivation of educators profoundly impacts the quality of computer science training. Teacher motivation is a vital factor impacting educational quality, as it influences lesson design, student engagement, and overall educational efficacy (Yavuz & Karadeniz, 2009). Teacher motivation is a determinant that directly impacts students' achievement in academic pursuits. Motivated educators execute their classes with more efficiency, while those lacking motivation view lessons mostly as a burden (Mabula, 2013). Teacher motivation is seen as an essential factor for success in education. Modern motivation research employs more sophisticated frameworks than merely distinguishing between intrinsic and extrinsic motivation; notably, Self-Determination Theory differentiates between autonomous motivation (such as intrinsic interest and alignment with professional values) and controlled motivation (such as external pressures), providing a more comprehensive foundation for scale development and interpretation (Ryan & Deci, 2000). Previous studies frequently differentiated between intrinsic motivation (internal fulfilment) and extrinsic motivation (external rewards). Contemporary frameworks, such as Self-Determination Theory (SDT), construct motivation on a continuum ranging from autonomous to controlled forms, offering a more complex understanding (Ryan & Deci, 2013). Nonetheless, in the rapidly evolving and continuously changing field of computer science education, the matter of teacher motivation has not been sufficiently investigated. The framework of computer science education requires enhanced technical proficiency and continual updates compared to other disciplines (Ni et al., 2023). Therefore, computer science educators must have a compelling motivation to engage in continuous professional development and to provide their students with the most current material (Ni et al., 2023; Yadav et al., 2017). The motivation of computer science educators is essential for enhancing educational quality and promoting student success in this field. An examination of national and international literature regarding teacher motivation in computer science education highlights the importance and shortcomings of the subject. Although there is no targeted research on teacher motivation in computer science education within the national literature, there exist extensive studies regarding teacher motivation in general. The research highlights various factors affecting teacher motivation, such as the leadership styles of school administrators and the personal expectations of teachers (Coşkun, 2009; Duman, 2014; Elibol, 2013; Ertuğrul, 2021; İşgörür, 2020; Kulpcu, 2008).

Nonetheless, there exists a paucity of studies in the global literature regarding the motivation of computer science educators. The "Motivation to Teach Computer Science (MTCS)" scale, developed by Martin et al. (2023), is a significant and thorough evaluation of the motivations of computer science instructors. This measure evaluates instructors' motivations according to self-determination theory across four interconnected criteria. The study emphasized that teachers display a spectrum of motivation, ranging from external pressures to intrinsic drive. It has been established that efforts to enhance teacher motivation in computer science education must correspond with the instructors' requirements (Martin et al., 2023). These studies highlight the impact of teacher motivation on educational quality and emphasize the need to develop strategies to enhance teacher motivation in computer science education. The results, apparent in both national and international literature, highlight the necessity for comprehensive research on teacher motivation in computer science education in this study.

Presently, computer science education has been integrated into the curriculum at both the university level and from elementary school forward. Coding classes have been taught from an early age in the USA, Europe, and Far Eastern countries (Balanskat & Engelhardt, 2014). This situation constitutes substantial evidence of the swift global expansion of interest in computer science education. A primary justification for providing computer science education at a young age is the increasing demand for computer skills in the future workforce (Chen et al., 2017). In this context, it is essential for students to be introduced to computer science at a young age, allowing them to function as both consumers and creators in the technical domain (Grout & Houlden, 2014). Computer science education equips students with technical expertise while cultivating vital skills such as problem-solving, critical thinking, and creativity (Wing, 2006). While this study was executed inside the national framework of Türkiye, its contributions possess international significance. Motivation serves as a universal catalyst for teacher effectiveness, and the validated instrument created herein provides a framework that may be customized or evaluated in various nations.

This study is grounded in Self-Determination Theory (SDT), which conceptualizes motivation along a continuum from autonomous to controlled forms and emphasizes basic psychological needs (autonomy, competence, relatedness) as drivers of sustained professional engagement (Ryan & Deci, 2000). To account for organizational and management-related influences observed in our factor structure, we complement SDT with the Job Demands–Resources (JD-R) model, which highlights how job resources (e.g., administrative support, equipment, workload management) can foster motivation and buffer job demands (Bakker & Demerouti, 2007). Mapping our instrument and findings to these frameworks allows a more nuanced interpretation than a simple intrinsic–extrinsic dichotomy. The two-factor structure—encompassing both purpose-driven (SDT) and management-related (JD-R) elements—represents constructs that surpass national boundaries. This work offers a psychometrically robust instrument and empirical evidence from the burgeoning field of school computers, contributing to worldwide dialogues on teacher motivation and facilitating comparative research across many educational systems. This research aims to rectify a significant gap in the field by examining teacher motivation in computer science education. This study aims to address the following two principal research topics to accomplish its objective:

RQ1. Is the Perception Scale for Professional Motivation in Computer Science Education a valid and reliable instrument for measuring teachers' professional motivation?

RQ2. What are the underlying factors that shape the professional motivation of computer science teachers?

RQ3. To what extent do these motivational factors differ according to demographic and professional characteristics (e.g., gender, university of graduation, educational level, years of professional experience, and city of assignment)?

2. Method

This research utilized a quantitative methodology to examine teacher motivation in computer science education. The fundamental characteristic of quantitative research is that the data may be represented and analysed numerically (Karasar, 1994). The study aims to identify several factors affecting teacher motivation through quantitative analysis and to draw implications from the findings. The relational screening model was preferred in the study as one of the survey methodologies. This model's correlation type enables a more sophisticated analysis of the relationship between variables. This study utilized the relational screening paradigm to evaluate the established scale and examine variations in teachers' professional motivation based on demographic factors like gender, educational background, years of experience, and location of assignment.

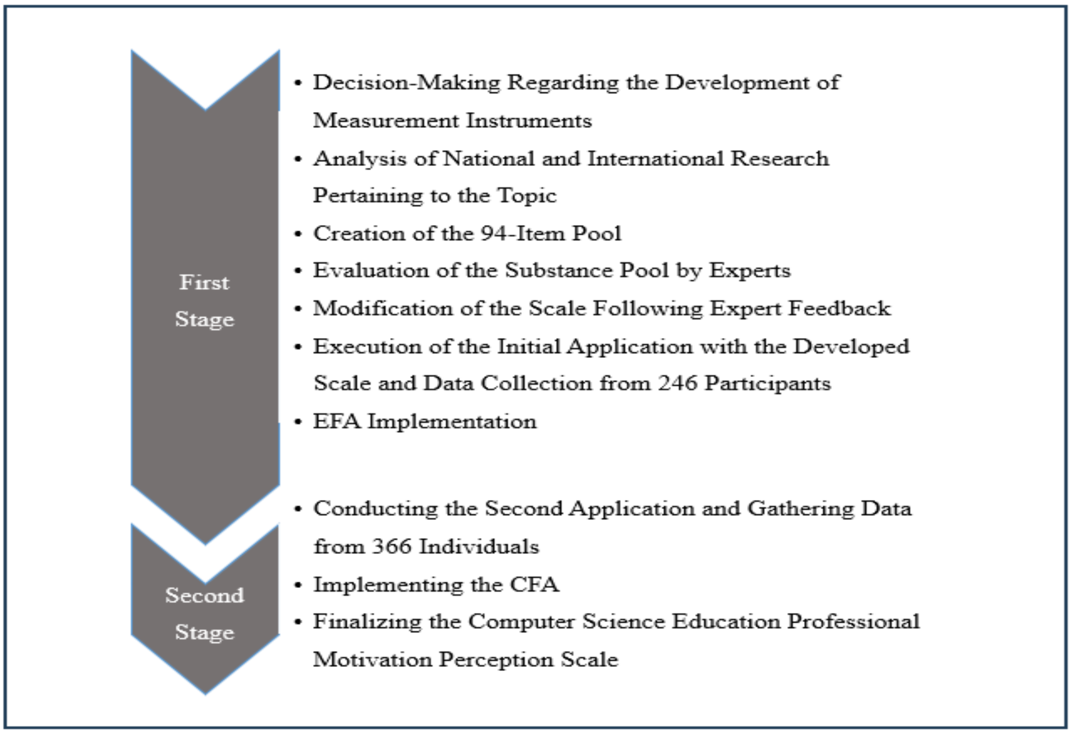

Figure 1. Operations Executed in Phases 1 and 2

This model enables the analysis of the relationship between teacher motivation and recognized effective elements, while predicting the prospective effects of these interactions on educational processes. Karasar (2003) contends that the relational screening model is an effective method for statistically evaluating the relationship between many variables. This study aims to clarify the factors affecting the motivations of computer science educators.

2.1. Participants

In study, data from extensive cohorts is employed to obtain critical information (Büyüköztürk, et. al., 2017). The study population consists of computer educators working throughout Turkey. This research utilized a sampling approach to obtain more accurate information about a specific demographic instead of including the entire population. A sample is defined as a subset that represents a certain part of the population, forming the foundation for the researcher's inquiry (Büyüköztürk et al., 2017). This study utilized a convenience sampling method, a variant of purposive sampling. This method entails choosing easily accessible individuals to facilitate and optimize the data collection process for the researcher (Yıldırım & Şimşek, 2003). As a result, readily accessible computer instructors in Turkey have formed the study group for the project. This technique has enabled the formation of a sample suitable for the research objectives, taking into account practical limitations such as study duration and accessibility. The scale was administered online through a survey link distributed to computer science educators in both public and private institutions throughout Türkiye. Nonetheless, the predominant portion of respondents originated from public schools, while private school educators were inadequately represented in the sample. The study utilized convenience sampling of easily accessible teachers; hence the findings cannot be confidently applied to all computer science educators in Türkiye. The sample may not accurately reflect the diversity of geographies, educational institutions, and available resources nationwide. Among the final scale participants, Sakarya exhibited the highest representation at 15.1% (f=28), whereas only one participant (0.5%) was sourced from various provinces including Adıyaman, Afyonkarahisar, Bingöl, Bitlis, Burdur, Edirne, Elazığ, Erzincan, Giresun, Karaman, Kırıkkale, Kırşehir, Konya, Mersin, Muğla, Muş, Rize, Tekirdağ, Trabzon, and Yalova. This disproportionate distribution further constrains the generalizability of the findings. Furthermore, despite the survey being disseminated to educators in both public and private institutions, the questionnaire lacked a question specifying the kind of institution, rendering it impossible to ascertain the precise representation of private school teachers in the sample. A scale development study was conducted during the project's initial phase. Subsequent to the scale's creation, the final application was implemented utilizing the acquired scale. Data were gathered from a total of 186 computer educators for the final application. Table 1 below displays the statistics regarding the gender variable of the individuals that participated in the final application.

Table 1. Data Regarding the Gender Variable of Participants in the Final Application

Gender	**Frequency (f)**	**Percentage (%)**
Male	115	61.8
Female	71	38.2
Total	186	100.0

2.2. *Data Collection Tools*

This study utilizes a Likert-type scale, designated as the "Perception of Professional Motivation in Computer Science Education Scale," developed by the researcher, as the instrument for data collection to achieve the research objective. Likert-type scales are tools commonly utilized in social sciences to evaluate individuals' attitudes regarding a specific subject. Tezbaşaran (1997) contends that Likert-type scales are often preferred for their capacity to measure equal intervals. The scale utilized in this study was deemed appropriate for this reason. The developed scale consists of two main dimensions: 'Factors Arising from Education - Teaching' and 'Factors Arising from Management.' These two dimensions aim to comprehensively evaluate instructors' views on professional motivation. A comprehensive content validation approach was undertaken to guarantee that the scale accurately represented the constructs delineated in our theoretical framework (SDT and JD-R). The scale's development entailed a multi-phase process: (1) an initial pool of 94 items was created via literature review; (2) items were refined following evaluation by a language expert; (3) three experts in computer science education assessed the items for clarity, representativeness, and content validity; (4) a pilot version comprising 31 items was administered; (5) Exploratory Factor Analysis (EFA) condensed the instrument to 26 items across two factors; and (6) Confirmatory Factor Analysis (CFA) further refined the scale to its final structure of 18 items. This systematic procedure offers substantial evidence for the construct validity and reliability of the scale. An initial item pool of 94 statements was developed based on this method. The pool underwent an initial evaluation by a linguistic expert for clarity, followed by requisite changes. The modified pool was subsequently appraised by three specialists in computer science education, who evaluated the items for relevance, comprehensiveness, and intelligibility. In response to their suggestions, the items were improved and condensed to 31, which were included in the pilot study. Experts evaluated each item based on clarity, relevance, and representativeness, and their written comment was integrated into the modifications. The expert review process demonstrated the content validity of the scale. The construction of items and the structure of the scale were guided by Self-Determination Theory (SDT) and the Job Demands-Resources (JD-R) model. Items included under the 'Education/Teaching-Based' factor predominantly represent educators' perception of professional significance, acknowledgment from parents and the community, and support at the classroom level—elements consistent with Self-Determination Theory's autonomous motivation and the needs for relatedness and competence. The components of the 'Management-Based' factor encompass administrative support, equipment, and workload concerns, so aligning with JD-R job resources. Table 2 presents a comprehensive mapping of each item to its respective theoretical concept.

Table 2. Mapping of Scale Items to Theoretical Constructs

Item Code	Item (short description)	Factor	Theoretical Construct (SDT / JD-R)
m27	Lack of peer praise reduces my motivation	Management	JD-R: Social support as job resource
m30	Adequacy of software affects motivation	Management	JD-R: Material/technical resources
m21	Admin not sensitive to my work reduces motivation	Management	JD-R: Organizational support
m24	Gaining trust of school administration increases motivation	Management	JD-R: Organizational trust/support
m29	Adequacy of equipment affects motivation	Management	JD-R: Material resources
m28	Knowing I will retire in this profession affects motivation	Management	JD-R: Perceived Job security / long-term prospects
m22	Admin praise increases motivation	Management	JD-R: Recognition as job resource
m31	Supervisors' fair treatment affects motivation	Management	JD-R: Fairness / justice as job resource
m26	Peer praise increases motivation	Management	JD-R: Collegial support
m23	Admin not praising my work reduces	Management	JD-R: Recognition deficit /

	motivation		lack of resources
m19	Transportation between home–school affects motivation	Management	JD-R: Physical/structural resources (workload strain)
m16	Living in an urban area affects motivation	Management	JD-R: Contextual resources/constraints
m25	Lack of admin trust reduces motivation	Management	JD-R: Organizational trust deficit
m20	Admin sensitivity affects motivation	Management	JD-R: Organizational support
m17	Distance home–school affects motivation	Management	JD-R: Physical strain / resource constraint
m5	Social media's negative attitude affects motivation	Education/Teaching	SDT: Controlled motivation (external pressures, social image)
m7	Parents' trust increases my motivation	Education/Teaching	SDT: Relatedness / autonomous motivation
m3	Praise from society increases my motivation	Education/Teaching	SDT: External recognition integrated as autonomous motivation

The items on the scale are assessed utilizing a five-point Likert-type rating system. Participants received five response options for each item: "Strongly Agree," "Agree," "Neutral," "Somewhat Agree," and "Disagree," so obtaining quantitative data on teachers' motivation levels. This grading method allows participants to express their ideas with increased flexibility and breadth (Tezbaşaran, 1997). This scale was created to evaluate the professional motivations of computer science educators and has become a crucial data source in achieving the study's primary goal by analysing various factors that affect instructors' motivations.

2.3. Data Analysis

The data obtained during the scale development process was subjected to exploratory and confirmatory factor analysis. The exploratory factor analysis was conducted using SPSS version 25.0 software. Subsequently, confirmatory factor analysis was conducted using AMOS 24.0 software. Following these methods, the data obtained from the developed scale were analysed using SPSS 25.0 software. Exploratory factor analysis (EFA) was performed utilizing Principal Axis Factoring on the Pearson correlation matrix with an oblique rotation (Direct Oblimin, $\delta = 0$), based on the anticipation of correlated factors. Items were maintained if their principal pattern loading was $\geq .40$ and the difference between the primary and secondary loading was $\geq .10$; items with communalities $< .30$ were deemed for removal. Factor retention was determined by eigenvalues exceeding 1 and the examination of the scree plot.

3. Results

The study methodology is structured into three phases: Phase 1 (item generation and content validation), Phase 2 (exploratory and confirmatory factor analyses for scale construction), and Phase 3 (final application of the validated scale). The findings are delineated into two primary sections: the initial phase (integrating Phases 1 and 2 for scale development) and the final phase (Phase 3 application)

3.1. Results of Exploratory Factor Analysis (Initial Phase)

The research technique has three phases: Phase 1 (item generation and content validation), Phase 2 (exploratory and confirmatory factor analyses for scale development), and Phase 3 (final implementation of the approved scale). The results are categorized into two main sections: the starting phase (combining Phases 1 and 2 for scale development) and the concluding phase (Phase 3 application).

Table 2. Results of the Kaiser-Meyer-Olkin (KMO) Measure and Bartlett's Test for the EFA Data Set

KMO Coefficient		0,968
Bartlett Test	χ^2	6251,976
	sd	325
	p	0,000

Tabachnick and Fidell (2013) assert that the KMO test value should be at least 0.6. The KMO test value for the dataset (KMO= 0.968), beyond the threshold, indicates a highly significant and normal distribution (Tavşancıl, 2018). After verifying that the KMO test values satisfied the necessary criteria, exploratory factor analysis (EFA) was conducted. Subsequent to the exploratory factor analysis, the factor loadings table indicated that specific scale components demonstrated cross-loading. Akgün et al. (2017) defines items that load on multiple factors as cross-loading items, stating that the difference in values between the factors must surpass 0.10. He emphasizes the importance of removing items that do not meet this criterion from the scale. Subsequent to the EFA, some alterations were executed on the "Computer Science Education Professional Motivation Perception Scale" to enhance its effectiveness. The overlapping entries m12, m14, m15, and m18 were subsequently removed from the scale. Items were maintained if their primary loading was ≥ .40 and cross-loadings on other factors were < .30, with a minimum difference of .10 between primary and secondary loadings to ensure discriminant validity (Tabachnick & Fidell, 2013). The tables proposed for examination in the factor analysis study were methodically reviewed, indicating that m1 demonstrated no substantial correlation with three items in the correlation matrix. As a result, the m1 item was omitted from the scale. Items were preserved according to established EFA criteria: (a) primary factor loading of at least .40, (b) cross-loading of less than .30 on any non-primary factor, and (c) conceptual alignment with the factor theme. Items that did not meet these criteria were eliminated progressively. According to these regulations, five items (m1, m12, m14, m15, m18) were discarded. Table 4 illustrates that items distinctly loaded onto two connected variables. A Heywood case for item m27 (loading = 1.022) was observed but is allowable under oblique rotation (see to Table 4 comment). Item m11 was cross-loaded but kept under Factor 2 due to its superior loading of .50. Factor 1 was designated as Management-Based Motivation, whereas Factor 2 was designated as Education/Teaching-Based Motivation, according to the conceptual consistency of the items. Following these processes, it was determined that the scale comprises 26 items and exhibits a two-factor structure.

The table of total variance produced by these operations is displayed below. Factor retention was determined by the Kaiser criterion (eigenvalues > 1.0) and corroborated by visual analysis of the scree plot, both suggesting a two-factor solution.

Table 3. Aggregate Variance Table Subsequent to EFA

	Initial Core Values			**Sum of Squares of Loadings**		
Factor	**Total**	**Variance %**	**Cumulative %**	**Total**	**Variance %**	**Cumulative %**
1	16,421	63,158	63,158	16,421	63,158	63,158
2	1,181	4,541	67,700	1,181	4,541	67,700
3	0,930	3,576	71,275			

The cumulative total variance must be at least 60% for social sciences. Thus, the overall variance of the dataset following the EFA (67.700) surpasses this ratio. Subsequent to the exploratory factor analysis, it is important to examine the factor loading table.

Table 4. Pattern Matrix of Factor Loadings (Principal Axis Factoring, Direct Oblimin Rotation)

Item No	**Item**	**Factor 1**	**2**
m27	The fact that other teachers at school do not praise my work affects my teaching motivation.	1,022	
m30	The adequacy of the software I will use in the course affects my course motivation.	0,883	
m21	The fact that the school administration is not sensitive to my work affects my course motivation.	0,878	
m24	Gaining the trust of the school administration affects my motivation.	0,877	
m29	The adequacy of the equipment I will use in the lesson affects my motivation.	0,844	
m28	Knowing that I will retire in this profession affects my teaching motivation.	0,824	
m22	The fact that the school administration praises my work affects my course motivation.	0,778	
m31	Administrative supervisors' fair treatment of the staff affects my course motivation.	0,772	
m26	The fact that other teachers at school praise my work affects my teaching motivation.	0,768	

m23	The school administration not praising my work	0,735	
m19	The mode of transportation between school and home affects my motivation for studying.	0,710	
m16	Living in an urban area affects my motivation to study.	0,656	
m25	Not having earned the trust of the school administration affects my motivation to study.	0,656	
m20	The school administration's sensitivity to my work affects my motivation in class.	0,641	
m17	The distance between school and home affects my motivation to study.	0,576	
m10	Negative parent-teacher cooperation affects my motivation in class.	0,341	
m5	Social media's negative attitude and stance towards the teaching profession affects my motivation in class.		0,955
m7	Parents' trust in me affects my motivation to teach.		0,928
m3	People in society praising me for my profession affects my motivation to teach.		0,845
m6	In situations involving students, parental support affects my motivation to teach.		0,771
m4	Social media's positive attitude and stance towards the teaching profession affects my motivation in class.		0,758
m9	Good parent-teacher cooperation affects my motivation in class.		0,754
m8	Parents' belief that I perform my job well affects my motivation to teach.		0,679
m2	The negative perception of the teaching profession among people in society affects my motivation to study.		0,626
m13	The fact that the place where I live meets my personal needs affects my motivation to study.		0,560
m11	The small size of the place where I live affects my motivation to study.	0,330	0,501

Extraction is equivalent to Principal Axis Factoring. Rotation equals Direct Oblimin ($\delta = 0$). The values reported are coefficients of the pattern. Standardized regression weights, as opposed to correlations, can yield values marginally exceeding 1.00 (e.g., m27 = 1.022) in oblique solutions (Tabachnick & Fidell, 2013). Item m11 exhibited cross-loadings of .33 on Factor 1 and .50 on Factor 2. The item was retained under Factor 2 due to its larger loading, which surpassed the .40 criterion. The Cronbach Alpha coefficient for the initial factor of the developed scale was 0.965, whilst the coefficient for the succeeding factor was 0.946.

Table 5. Cronbach's Alpha Values for the Factors Derived from Exploratory Factor Analysis

Factor	Article Number	Cronbach's Alpha Value
1	16	0.965
2	10	0.946

The results indicate that the scale possesses high dependability (Alpar, 2016). A study of the top group, which was 27% lower, was subsequently conducted on the dataset to evaluate the scale's discriminative capabilities.

Table 6. Reliability of Sub-Group and Super-Group Following Exploratory Factor Analysis

Factors	N	Average	Average difference	p
Top group	66	67,7576	40,37879	0,000
Subgroup	66	27,3788	40,37879	0,000

The t-test results revealed that the mean for the upper group was 67.7576, while the mean for the lower group was 27.3788. The difference between the means indicates that the developed scale is significantly discriminative ($p<0.05$). The initial factor is classified as Educational – Instructional Factors, whereas the subsequent element is referred to as Management-Related Factors, according to the items identified in the investigation. The two extracted factors exhibited a moderate correlation, suggesting that although they are conceptually separate, they share shared variance in line with theoretical assumptions.

3.2. Results for Confirmatory Factor Analysis (Initial Phase)

Following the adjustments, the Perception of Professional Motivation Scale in Computer Science Education was redistributed online and completed by 366 computer educators. Confirmatory Factor Analysis (CFA) is essential in the research of scale development (Akgün et al., 2017). Therefore, to assess the feasibility of doing a Confirmatory Factor Analysis (CFA) on the obtained dataset, the correlation between the individual items of the scale and the total scale score was examined. The analysis utilized Pearson correlation coefficients.

Table 7. Confirmatory Factor Analysis Table 7. Impact on Mean, Variance, and Item-Total Correlation Table Upon the Deletion of an Item from the CFA Data Set

Article No	Effect on the Average when the item is deleted	Effect on Variance When Item Deleted	Item-Total Score Correlation
m2	43,20	115,966	0,319

m3	42,98	114,268	0,402
m4	42,81	112,058	0,448
m5	42,86	112,310	0,454
m6	42,84	111,230	0,488
m7	42,63	111,117	0,426
m8	42,80	112,171	0,457
m9	42,81	112,418	0,439
m10	42,71	111,242	0,446
m11	42,67	109,903	0,517
m13	42,63	111,824	0,337
m16	42,61	113,406	0,284
m17	42,80	112,963	0,434
m19	42,75	110,185	0,512
m20	42,81	110,511	0,533
m21	42,79	111,702	0,440
m22	43,06	115,325	0,347
m23	42,92	113,445	0,405
m24	42,91	113,389	0,433
m25	42,80	112,105	0,440
m26	42,80	112,533	0,433
m27	42,76	111,201	0,481
m28	42,87	110,314	0,512
m29	42,73	111,476	0,417

The item-total score correlation values of the scale ranged from 0.284 to 0.533, and these correlations were statistically significant. Subsequently, the KMO (Kaiser-Meyer-Olkin) test was re-administered to assess the adequacy of the dataset for confirmatory factor analysis.

Table 8. Results of the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test for the CFA Data Set

KMO Coefficient		0,886
Bartlett Test	x^2	2228,704
	sd	325

p	0,000

The Bartlett test findings indicate a significant chi-square value ($x^2=2228.704$; sd=325; $p<0.05$), suggesting that the dataset demonstrates a multivariate normal distribution. The acceptable fit indices obtained from the confirmatory factor analysis significantly influence the scale's acceptability.

Table 9. Fit Index Benchmarks Adopted (Schreiber et al., 2006)

Index	Value
GFI	>0,90
AGFI	>0,90
NFI	>0,90
CFI	>0,90
RMSEA	<0,08

Furthermore, Çokluk et al. (2018) assert that an RMSEA value below 0.08 signifies acceptable fit, a CFI value above 0.90 denotes acceptable fit, and an NFI value surpassing 0.90 suggests good fit. Alongside these values, other critical factors must be considered during confirmatory factor analysis, particularly prior to item removal or model enhancement. The Standardized Regression Coefficient is paramount among these. The standardized regression coefficient indicates the capacity of observed variables to forecast latent variables, with a preference for these values to exceed 0.60 (Karagöz, 2021). Consequently, to enhance the scale, the Standardized Regression Coefficient is considered while eliminating items, and the item with the lowest value is discarded from the scale. Another element to contemplate in enhancing the Confirmatory Factor Analysis (CFA) model is the modification indices. The modification index signifies the anticipated decrease in the Chi-Square value when a parameter is altered or a new parameter is incorporated into the model (Sümer, 2000). Consequently, Confirmatory Factor Analysis (CFA) was utilized on the dataset. The fit index values derived from the CFA without any alterations are presented below. As shown in Table 10, the initial CFA model did not reach acceptable fit indices, indicating that the proposed two-factor structure required further refinement.

Table 10. Preliminary Fit Indices and Values for the Confirmatory Factor Analysis Model

Index	Value
GFI	,874
AGFI	,852
NFI	,720
CFI	,825
RMSEA	,056

As shown in Table 10, the initial CFA model did not reach acceptable fit indices. Consequently, some modifications were implemented to improve model fit. Based on low standardized loadings and modification indices, items m16, m13, m22, m2, m29, m10, m7, and m21 were sequentially removed from the scale, beginning with the lowest loading values. At each step, fit indices were re-assessed. In addition, three error covariances suggested by the modification indices were incorporated into the model. After these revisions, the fit indices reached acceptable levels, as reported in Table 11.

Table 11. Fit Indices and Values of the Final CFA Model

Index	Value
GFI	,945
AGFI	,929
NFI	,870
CFI	,954
RMSEA	,036

As shown in Table 11, the final CFA model demonstrated good fit. The RMSEA value (.036) indicates excellent fit, while the AGFI (.929), NFI (.870), and CFI (.954) reflect acceptable to good levels of fit (Schreiber et al., 2006). The GFI value (.945) is also considered satisfactory (Hooper et al., 2008). These results confirm that the revised two-factor model provided a valid representation of the data. Note. GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; NFI = Normed Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

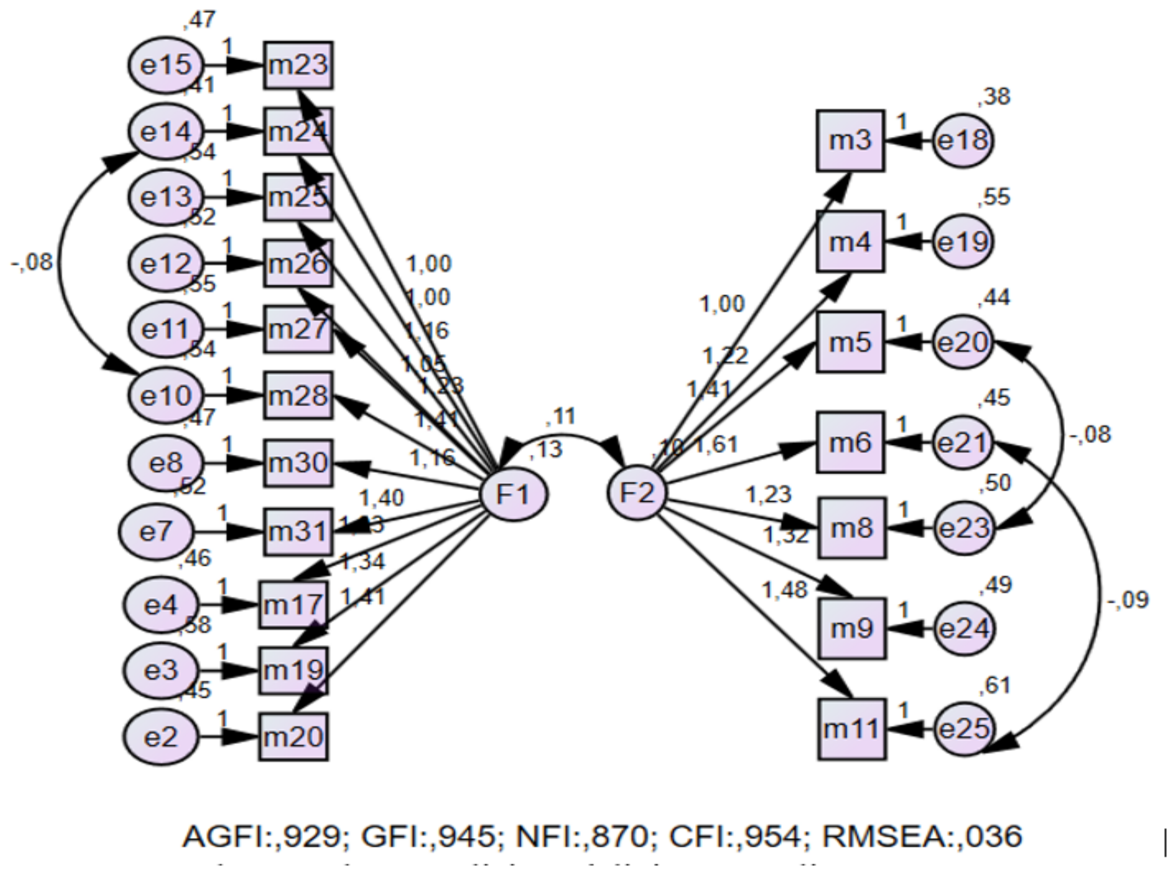

Figure 2. Conclusive Version of the Confirmatory Factor Analysis Model

Following the Confirmatory Factor Analysis (CFA), a 27% lower group - upper group analysis was performed on the dataset to assess the scale's discriminative power, and Cronbach's Alpha was utilized to evaluate its reliability

Table 12. Reliability of Sub-Group and Upper-Group Post-CFA

Factors	N	Average	Average difference	p
Top group	99	41,2121	18,45455	0,000
Subgroup	99	22,7576	18,45455	0,000

The established Computer Science Education Professional Motivation Perception Scale significantly differentiates between the lower and upper groups ($p<0.05$) due to the enhancements implemented.

Table 13. Cronbach's Alpha Values for Factors Established Post-CFA

Factor	Article Number	Cronbach's Alpha Value
1	11	0.803
2	7	0,713

The Cronbach Alpha values indicate that the scale is at an appropriate level. Upon completion of all phases, the scale comprising 2 factors and 18 elements is prepared for final implementation.

3.3. Conclusive Findings of Application Results (Phase Two)

In the conclusive application of the Computer Science Education Professional Motivation Perception Scale, 186 computer science educators participated, with the distribution completed digitally. To choose the analytical methods for evaluating the final scale data, it is crucial to first examine the normal distribution of the dataset. Literature evaluations show that parametric tests are used for data with a normal distribution, while non-parametric tests are applied to data that diverges from normality. Subsequently, after analysing the descriptive statistics of the final scale, normality tests were conducted by computing the mean of the items that constitute the scale.

Table 14. Statistical Data for the Normality Test of the Final Scale

	Statistics	Standard Error
Average	1,7572	
Median	1,6667	
Variance	,229	
Standard Deviation	,47898	
Skewness Coefficient	,731	,178
Kurtosis Coefficient	,028	,355

According to Tabachnick & Fidell (2013), a scale demonstrates a normal distribution if the skewness and kurtosis values range from -1.5 to +1.5. Upon analysing the skewness and kurtosis values of the final scale, it was concluded that the scale exhibits a normal distribution. Consequently, parametric tests, including the t-Test and One-Way ANOVA, were performed on the final scale data. The histogram and Q-Q Plot of the final scale's data set, indicating a normal distribution, are presented below.

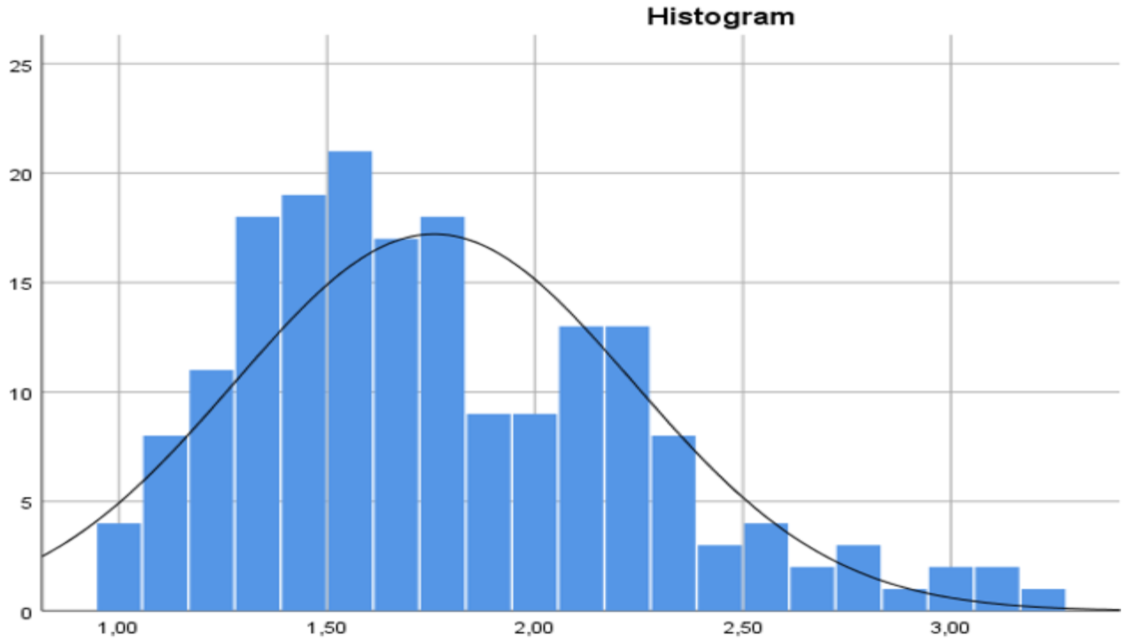

Figure 3. Histogram of the Normality Assessment for the Final Measurement

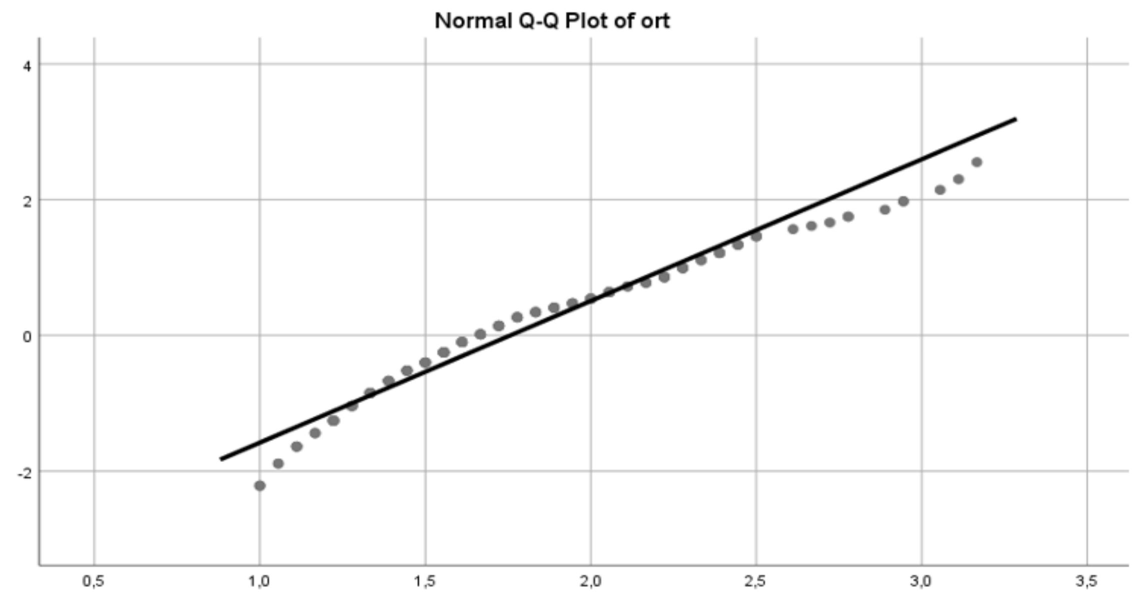

Figure 4. Q-Q Plot illustrating the normality assessment for the final measurement

Subsequent to these phases, the data acquired about the research's sub-problems were examined. In the development process of the Computer Science Education Professional Motivation Perception Scale, reliability analyses were conducted, including EFA and CFA, followed by Cronbach's alpha coefficient and 27% lower and upper group comparisons. Based on the findings obtained from these analyses, it can be stated that the scale in question is a reliable measurement tool. The evaluation of construct validity, guided by EFA and CFA findings, demonstrates that the Computer Science Education Professional Motivation Perception Scale is a legitimate tool. The t-test results for the Computer Science Education Professional Motivation Perception Scale scores, classified by gender, are displayed in the table below.

Table 15. T-Test Outcomes of the Perception of Professional Motivation Scale in Computer Science Education by Gender Variable

Factor	Groups	N	X	ss	t	sd	p
Factors related to Education and Training	Male	115	1,7715	,53436	,102	184	,919
	Female	71	1,7631	,56092			
Management _Factors	Male	115	1,7143	,53251	,407	184	,684

The T-Test results indicate no significant difference between male and female computer science instructors for Education – Teaching Source variables (t[184]=0.102; p>0.05). Nonetheless, it has been established that there is no substantial difference between male and female computer science educators about Management-Related Factors (t[184]=,407;p>0,05). Consequently, it has been determined that the factors influencing the motivation of computer science educators remain consistent across genders for each sub-dimension. Prior to conducting the analysis of the Computer Science Education Professional Motivation Perception Scale scores based on the university attended, the assumption of homogeneity of variances was assessed using the Levene Test to ascertain the uniform distribution of the groups.

Table 16. Levene's Test Results for the University Graduated from Variable of the Perception of Professional Motivation Scale in Computer Science Education

Factor	Type of Statistics	Levene's Statistic	p
Factors related to Education and Training	Based on the average	1,409	,108
Management Factors	Based on the average	1,604	,105

The findings of the Levene Test indicate that the factors are homogeneously distributed (p>0.05). A One-Way ANOVA test was conducted based on this result.

Table 17. Results of the One-Way ANOVA Test on the Perception of Professional Motivation Scale in Computer Science Education by University Graduates

Factor		Sum of Squares	sd	Squares Mean.	F	p
Factors related to Education and Training	Between Groups	9,170	35	,262	,865	, 684
	In Group	45,410	150	,303		
	Total	54,579	185			
Management Factors	Between Groups	8,593	35	,246	,877	, 667
	In Group	41,991	150	,280		
	Total	50,584	185			

The findings of the ANOVA test indicated no significant difference between Education – Teaching-Related factors and Management-Related factors concerning the university attended ($p<0.05$). Prior to analysing the scores of the Computer Science Education Professional Motivation Perception Scale based on educational levels through the One-Way ANOVA test, the assumption of homogeneity of variances was assessed using the Levene Test to ascertain the uniform distribution of the groups.

Table 18. Levene's Test Results for the Educational Level Variable in the Perception of Professional Motivation Scale for Computer Science Education

Factor	Type of Statistics	Levene's Statistic	p
Factors related to Education and Training	Based on the average	,244	,865
Management Factors	Based on the average	1,423	,238

The Levene Test results indicate that the distributions of Education-Teaching Related Factors and Management Related Factors are homogeneous ($p > 0.05$). Following the confirmation of homogeneity of variances, the One-Way ANOVA test analysis was performed.

Table 19. Outcomes of the One-Way ANOVA Test for the Variable of Educational Level in the Perception of the Professional Motivation Scale in Computer Science Education

Factor		Sum of Squares	sd	Squares Mean.	F	p
Factors related to Education and Training	Between Groups	2,192	3	,731	2,539	,058
	In Group	52,387	182	,288		
	Total	54,579	185			
Management Factors	Between Groups	2,927	3	,976	3,725	,012
	In Group	47,658	182	,262		
	Total	50,584	185			

The analysis of the One-Way ANOVA test revealed no significant difference between the education levels examined and the Education-Teaching Source components (p=0.058; p<0.05). Furthermore, a statistically significant difference has been identified between the sub-dimension of Management-Related Factors and the educational level examined (p=0.012; p<0.05). An LSD test was conducted to identify the subgroups exhibiting significant differences. The exam results indicate a substantial difference (p<0.05) in Management-Related Factors between middle school and vocational high school levels, although no such difference exists among the other levels. Prior to conducting the analysis of the Computer Science Education Professional Motivation Perception Scale scores based on years of professional experience through a One-Way ANOVA test, the assumption of homogeneity of variances was assessed by examining the groups for a uniform distribution via the Levene Test.

Table 20. Levene's Test Results for the Variable of Years of Professional Experience in the Perception of Professional Motivation Scale for Computer Science Education

Factor	Type of Statistics	Levene's Statistic	p
Factors related to Education and Training	Based on the average	1,309	,273
Management Factors	Based on the average	,581	,628

Upon analysing the outcomes of the Levene Test, it was concluded that the variances of Education-Teaching Related Factors and Management Related Factors were homogeneously distributed (p>0.05). Upon establishing the homogeneity of variances, the One-Way ANOVA test analysis was performed.

Table 21. Outcomes of the One-Way ANOVA Test for the Variable of Years of Professional Experience in Relation to the Perception of the Professional Motivation Scale for Computer Science Education

Factor		Sum of Squares	sd	Squares Mean.	F	p
Factors related to Education and Training	Between Groups	2,103	4	,526	1,813	,128
	In Group	52,476	181	,290		
	Total	54,579	185			
Management Factors	Between Groups	2,369	4	,592	2,223	,068
	In Group	48,216	181	,266		
	Total	50,584	185			

The research revealed no significant difference between Education-Training-Related variables and years of professional experience (p=0.128; p<0.05). It has been established that there is no substantial difference between Management-Related variables and years of professional experience (p=0.068; p<0.05). Prior to conducting the study of the Computer Science Education Professional Motivation Perception Scale scores by city through a One-Way ANOVA test, the assumption of homogeneity of variance was assessed using the Levene Test to ascertain whether the groups exhibit a homogeneous distribution.

Table 22. Levene's Test Results for the City Variable in the Perception of Professional Motivation Scale within Computer Science Education

Factor	Type of Statistics	Levene's Statistic	p
Factors related to Education and Training	Based on the average	1,219	,221
Management Factors	Based on the average	1,233	,210

The findings of the Levene Test indicate that the Education-Training Related Factors and Management Related Factors have a homogenous distribution (p>0.05). Following the confirmation of homogeneity of variances, the One-Way ANOVA test analysis was performed.

Table 23. Results of One-Way ANOVA for the City of Employment Variable in the Perception of Professional Motivation Scale for Computer Science Education

Factor		Sum of Squares	sd	Squares Mean.	F	p
Factors related to	Between Groups	17,902	50	,358	1,318	,108

Education and Training	In Group	36,677	135	,272		
	Total	54,579	185			
Management Factors	Between Groups	15,622	50	,312	1,206	,199
	In Group	34,962	135	,259		
	Total	50,584	185			

The ANOVA test findings indicated no significant difference between Education-Training Related variables and the city of duty performance (p=0.108; p<0.05). No substantial difference was seen between the city of duty and Management-Related Factors (p=0.199; p<0.05).

4. Discussion And Conclusion

The Computer Science Education Professional Motivation Perception Scale aims to discover the factors affecting the motivation of computer science educators. The scale's content validity was first evaluated, subsequently leading to the development of a critical item pool through an extensive review of national and international literature. A total of 94 items were assessed by a language expert and subsequently submitted to three field specialists. Following the integration of expert feedback, revisions were made to the questionnaire, resulting in a 31-item tool named "Computer Science Education Professional Motivation Perception Scale." Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were employed to evaluate the construct validity of the instrument. Exploratory Factor Analysis (EFA) was conducted on data from 246 participants, resulting in the elimination of items m1, m12, m14, m15, and m18 from the scale, so yielding a two-factor structure of 26 items. These elements are classified as Education – Teaching-Oriented and Management-Oriented. To assess the scale's reliability, Cronbach's Alpha values and 27% upper-lower group comparisons were conducted, indicating that the scale exhibits robust dependability. Confirmatory Factor Analysis (CFA) was utilized to assess the structure obtained from Exploratory Factor Analysis (EFA) based on data gathered from 366 individuals. Subsequent to the CFA, some items (m2, m7, m10, m13, m16, m21, m22, m29) were discarded until the fit indices reached an acceptable threshold, culminating in a modified scale comprising 18 items. The model fit was assessed using many indices: GFI, AGFI, NFI, CFI, and RMSEA. The final 18-item, two-factor model demonstrated a satisfactory fit (GFI= 0.945, AGFI= 0.929, NFI= 0.870, CFI= 0.954, RMSEA= 0.036), conforming to established thresholds (Hu and Bentler, 1999). These indices validate that the two-factor model sufficiently encapsulates the data. The dependability was re-evaluated by Cronbach's Alpha values, determining that the scale is adequately reliable. Cronbach's Alpha values were .96 for the Management-Based factor and .94 for the Education/Teaching-Based component. The total scale produced an Alpha of .97, above the .70 benchmark suggested for internal consistency (Kalyar, Ahmad, & Kalyar, 2018). The composite reliability values surpassed .70, hence reinforcing reliability.

This scale, consisting of two components and eighteen elements, is considered a reliable, valid, and useful measurement tool. The two-factor structure is consistent with the theoretical frameworks underpinning this investigation. Pragmatic elucidation of the two-factor model. The Education–Teaching-Based aspect underscores the significance of autonomy-supportive classroom practices, such as providing meaningful choices and prioritizing mastery feedback, while also enhancing connections with families and the community to reinforce teachers' autonomous motivation. The Management-Based element underscores employment resources identified by the JD-R model—transparent and equitable administrative procedures, prompt acknowledgment, and sufficient equipment/software—which can mitigate demands and maintain motivation. Explicitly framing interventions using Self-Determination Theory (needs for autonomy, competence, relatedness) and the Job Demands-Resources model (organizational resources) offers a theoretically informed framework for schools aiming to augment the professional motivation of computer science teachers. The Education–Teaching-Based factor encapsulates teachers' intrinsic motivation within Self-Determination Theory (SDT), encompassing aspects such as professional significance, acknowledgment from parents and the community, and classroom-level resources that fulfil the demands for relatedness and competence. The Management-Based factor relates to job resources in the JD-R model, including organizational trust, administrative assistance, and the sufficiency of equipment and infrastructure. This theoretical congruence offers additional evidence for the construct validity of the scale and contextualizes the findings within the wider field of motivation research.

Although motivation studies for educators in other disciplines exist at the national level, the lack of study focused on the motivation of computer science teachers is due to the absence of a measurement scale for evaluating their motivation. This situation underscores the imperative of creating a framework in the field. The development of the Computer Science Education Professional Motivation Perception Scale would significantly enrich the current literature. This scale will serve as the first national tool to evaluate the professional motivations of computer science educators, providing valuable data for scholars and educational institutions. The application of the scale may augment the breadth of quantitative and qualitative study into the factors influencing computer science teachers' motivation. Research examining the relationships between teachers' personality variations, work conditions, and motivations in educational settings can yield new insights on educational sciences. Globally, there is a dearth of research concerning the motivations of computer science educators, and the limited studies utilize scales that exhibit recognized validity and reliability. The recent international study presented the 18-item Motivation to Teach Computer Science (MTCS) scale, encompassing four dimensions: external pressures, external advantages, student benefits, and personal enjoyment (Martin, Baker, Haynes, & Warner, 2023). Positioning with relation to MTCS. While MTCS categorizes motives into four teaching-centric domains (external pressures/benefits, student benefits, personal enjoyment), our two-factor framework encompasses a wider ecological perspective of professional motivation, incorporating organizational factors (management, resources, recognition) in addition to teaching-related influences. This differentiation is beneficial for governance and leadership: MTCS may provide greater diagnostic insights for pedagogical support, whereas our scale also highlights systemic levers—such as administrative trust, equity, and infrastructure—that school leaders may influence. While MTCS emphasizes instructors' motivation to instruct in computer science, our instrument concentrates on the professional incentive drivers within the Turkish educational setting, resulting in two factors: Education–Teaching-Based and Management-Based. Consequently, our research enhances MTCS by offering a verified, nationally normed instrument and empirical results pertinent to Turkey, encompassing subgroup analyses applicable to local administrative frameworks. However, the development of the Computer Science Education Professional Motivation Perception Scale will provide a foundation for international comparative study. An examination of the motivation levels of computer science instructors in different countries and the factors affecting this motivation could guide the formulation of global educational strategies. Moreover, examining the influence of cultural differences on motivation should assist in developing both universal and specific measures for enhancing teacher motivation. The study concluded with an examination of data from 186 computer science educators who completed the Computer Science Education Professional Motivation Perception Scale. The results demonstrated that the factors affecting the motivations of computer science professors were uniform across genders. This study indicates that gender does not substantially affect teachers' motivations. This outcome suggests that the motivating factors in our framework—autonomous motivation (SDT) and job resources (JD-R)—are seen similarly by male and female instructors. This indicates that motivational resources and requirements, as defined by SDT and JD-R, are independent of institutional background. Therefore, efforts to enhance motivation should use a gender-neutral and inclusive approach. International literature indicates some studies identifying gender disparities (Duursma, 2016), while others claim no substantial differences (Kippers et al., 2018). These findings indicate that educational institutions should cultivate cultures that enhance teacher motivation free from gender bias. No differences in motivating factors have been seen based on the university attended. This scenario indicates that the university does not affect the motivation of computer science instructors. This discovery raises questions about the impact of graduation on motivation and suggests that the quality of education is predominantly consistent among universities. Selvitopu & Taş (2020) found that motivation levels significantly varied according to undergraduate degree status. The motivational factors were consistent regardless of teachers' educational qualifications, focusing instead on managerial elements. No notable disparities were detected according to the city of assignment. A notable disparity was observed in the Management factor based on the educational level of the teachers (primary, secondary, or high school). This study utilized convenience sampling, potentially constraining the sample's representativeness and, therefore, the generalizability of the scale features and Phase 3 subgroup comparisons. The imbalance in group sizes for some demographics diminished the statistical power to identify minor effects and heightened the likelihood of Type I and Type II errors. All measurements were self-reported and cross-sectional, hence precluding causal inference. Subsequent research ought to replicate these findings utilizing probability samples (e.g., stratified sampling across areas and school types), gather longitudinal data to assess stability over time, and evaluate measurement invariance across significant subgroups. Educational caveat. The survey link was disseminated to both public and private schools; however, the questionnaire lacked a question to identify the type of school, preventing us from assessing any potential variations between the two types of institutions. Future applications must specifically document school type and utilize a stratified sample by sector to facilitate comparisons and improve external validity. Considerations for measurement. Prior to comparing subgroup means in subsequent investigations, multi-group confirmatory factor analysis (CFA) should be employed to ascertain configural, metric, and scalar invariance of the two-factor model across significant groups (e.g., gender, educational attainment). Furthermore, to alleviate common-method variance associated with single-source, self-report methodologies, subsequent research could integrate survey responses with observational or administrative metrics or implement temporal separation of measures. The study utilized convenience sampling; hence, the results from demographic subgroup analyses (e.g., gender, years in the profession, school type [public vs. private]) should be evaluated cautiously, since they may not be representative of the wider community of computer science educators. Nonetheless, a weakness of this study is the employment of convenience sampling, which constrains the generalizability of the results. By analysing the components via Self-Determination Theory (SDT) and the Job Demands-Resources (JD-R) model, our research broadens the relevance of these frameworks to computer science education, emphasizing the dual significance of personal meaning and institutional resources. Future research should utilize more representative sample techniques to improve external validity and offer a comprehensive understanding of the motivation of computer science educators.

Consequences for implementation and regulation. Based on our findings, school leaders and policymakers should prioritize (a) transparent and equitable administrative processes that acknowledge the contributions of computer science teachers, (b) dependable provision and upkeep of computer science-specific equipment and software, (c) organized parent-school engagement to enhance community recognition, and (d) professional development aligned with autonomy-supportive pedagogy. Resource allocation models at the system level must align with the unique management requirements of various educational stages, especially in vocational high schools where management-related motivation is notably elevated, thereby ensuring that organizational support is customized to the specific needs of stage-specific computer science curricula and infrastructure.

REFERENCES

Akgün, E., Karadeniz, Ş., Demirel, F., Kılıç, E., & Büyüköztürk, Ş. (2017). *Bilimsel araştırma yöntemleri*. Pegem Akademi Yayıncılık.

Alpar, C. R. (2016). *Spor Sağlık ve Eğitim Bilimlerinden Örneklerle Uygulamalı İstatistik ve Geçerlik Güvenirlik*. Detay Yayıncılık.

Bakker, A. B., & Demerouti, E. (2007). The Job Demands-Resources model: state of the art. *Journal of Managerial Psychology*, *22*(3), 309–328. https://doi.org/10.1108/02683940710733115

Balanskat, A., & Engelhardt, K. (2014). Computing our future Computer programming and coding - Priorities, school curricula and initiatives across Europe. *European Schoolnet (EUN Partnership AISBL)*.

Chen, G., Shen, J., Barth-Cohen, L., Jiang, S., Huang, X., & Eltoukhy, M. (2017). Assessing elementary students' computational thinking in everyday reasoning and robotics programming. *Computers & Education*, *109*, 162–175. https://doi.org/10.1016/j.compedu.2017.03.001

Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş. (2018). *Sosyal Bilimler İçin Çok Değişkenli İstatistik SPSS ve Lisrel Uygulamaları*. Pegem Akademi.

Coşkun, M. (2009). *İlköğretim Okullarında Motivasyon Araçları Hakkında Öğretmen Görüşleri Ve Doyum Düzeyleri Üzerine Bir Alan Araştırması* [Yüksek Lisans Tezi, Beykent Üniversitesi]. https://tez.yok.gov.tr

Duman, N. (2014). *Okul Yöneticilerinin Kullandıkları Motivasyon Faktörleri Ve Öğretmen Görüşleri* [Yüksek Lisans Tezi, Yeditepe Üniversitesi]. https://tez.yok.gov.tr/

Duursma, E. (2016). Who does the reading, who the talking? Low-income fathers and mothers in the US interacting with their young children around a picture book. *First Language*, *36*(5), 465–484. https://doi.org/10.1177/0142723716648849

Elibol, S. (2013). *Ortaöğretim Okullarında Motivasyon Araçları Hakkında Öğretmen Görüşleri Ve Doyum Düzeyleri Üzerine Bir Alan Araştırması* [Yüksek Lisansn Tezi, Yeditepe Üniversitesi]. https://tez.yok.gov.tr/

Ertuğrul, S. (2021). *Öğretmen Algılarına Göre Okul Müdürlerinin Toksik Liderlik Davranışları İle Öğretmenlerin Motivasyon Ve İş Tatmin Düzeyleri Arasındaki İlişki* [Yüksek Lisans Tezi, İstanbul Sabahattin Zaim Üniversitesi]. https://tez.yok.gov.tr/

Grout, V., & Houlden, N. (2014). Taking Computer Science and Programming into Schools: The Glyndŵr/BCS Turing Project. *Procedia - Social and Behavioral Sciences*, *141*, 680–685. https://doi.org/10.1016/j.sbspro.2014.05.119

Hooper, D., Coughlan, J., & Mullen, M. (2008). Evaluating model fit: a synthesis of the structural equation modelling literature. *In 7th European Conference on Research Methodology for Business and Management Studies*, 195–200.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

İşgörür, N. (2020). *Okul Yöneticilerinin Öğretmen Motivasyonunu Artırmaya Yönelik Yararlandığı Motivasyon Araçları* [Yüksek Lisans Tezi, Bahçeşehir Üniversitesi]. https://tez.yok.gov.tr/

Kalyar, M., Ahmad, B., & Kalyar, H. (2018). Does Teacher Motivation Lead to Student Motivation? The Mediating Role of Teaching Behavior. *Voprosy Obrazovaniya / Educational Studies Moscow*, *3*, 91–119. https://doi.org/10.17323/1814-9545-2018-3-91-119

Karagöz, Y. (2021). *Bilimsel Araştırma Yöntemleri*. Nobel Akademik Yayıncılık.

Karasar, N. (1994). *Bilimsel Araştırma Yöntemi*. Nobel Akademik Yayıncılık.

Karasar, N. (2003). *Bilimsel Araştırma Yöntemi*. Nobel Akademik Yayıncılık.

Kippers, W. B., Wolterinck, C. H. D., Schildkamp, K., Poortman, C. L., & Visscher, A. J. (2018). Teachers' views on the use of assessment for learning and data-based decision making in classroom practice. *Teaching and Teacher Education*, *75*, 199–213. https://doi.org/10.1016/j.tate.2018.06.015

Kulpcu, O. (2008). *İlköğretim Okullarında Görev Yapan Öğretmen Ve Yöneticileri Motive Etmede Kullanılabilecek Motivasyon Araçları Üzerine Bir İnceleme* [Yüksek Lisans Tezi, Gaziantep Üniversitesi]. https://tez.yok.gov.tr/

Mabula, J. S. (2013). Impact of motivation on commitment of teachers for public secondary schools in dar es salaam: a case of kinondoni district. *Master's Thesis, In Human Resource Management (Mhrm) of The Open Unıversity of Tanzania.*

Martin, N. D., Baker, S. N., Haynes, M., & Warner, J. R. (2023). The Motivation to Teach Computer Science (MTCS) scale: development, validation, and implications for use. *Computer Science Education*, 1–18. https://doi.org/10.1080/08993408.2023.2182561

Ni, L., Bausch, G., & Benjamin, R. (2023). Computer science teacher professional development and professional learning communities: a review of the research literature. *Computer Science Education*, *33*(1), 29–60. https://doi.org/10.1080/08993408.2021.1993666

Popovich, P. M., Gullekson, N., Morris, S., & Morse, B. (2008). Comparing attitudes towards computer usage by undergraduates from 1986 to 2005. *Computers in Human Behavior*, *24*(3), 986–992. https://doi.org/10.1016/j.chb.2007.03.002

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2013). *Intrinsic motivation and self-determination in human behavior*. Springer Science & Business Media.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review. *The Journal of Educational Research*, *99*(6), 323–338. https://doi.org/10.3200/JOER.99.6.323-338

Selvitopu, A., & Taş, A. (2020). Lise Öğretmenlerinin İş Doyumu ve Mesleki Motivasyon Düzeylerinin İncelenmesi. *Bayburt Eğitim Fakültesi Dergisi*, *15*(29), 23–42. https://doi.org/10.35675/befdergi.426989

Sümer, N. (2000). *Yapisal Eşitlik Modelleri: Temel Kavramlar ve Örnek Uygulamalar*. Türk Psikoloji Yazılari.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics (6th edn)*. Pearson Education.

Tavşancıl, E. (2018). *Tutumların ölçülmesi ve spss ile veri analizi (6. Baskı)*. Nobel Yayın Dağıtım.

Tezbaşaran, A. (1997). Validity issues of a likert type scale (a case study). *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, *13*, 41–45.

Wing, J. M. (2006). Computational Thinking. *Communications of the ACM*, *49*(3), 33–35.

Yadav, A., Stephenson, C., & Hong, H. (2017). Computational thinking for teacher education. *Communications of the ACM*, *60*(4), 55–62. https://doi.org/10.1145/2994591

Yavuz, C., & Karadeniz, C. B. (2009). Sınıf öğretmenlerinin motivasyonunun iş tatmini üzerine etkisi. *Uluslararası Sosyal Araştırmalar Dergisi*, *2*(9), 507–519.

Yıldırım, A., & Şimşek, H. (2003). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri*. Seçkin Yayıncılık.